R E C O R D

of the Meeting in the USSR of American and Soviet
Coordinators and Experts of the Joint US-USSR Working
Group for Cooperation in the Application of Computers
to Management in Regard to Topic 4, "Theoretical
Foundation for Software for Applications in
Economics and Management"

In accordance with the Agreement between the

Government of the United States of America and the Government

of the Union of Soviet Socialist Republics on Scientific

and Technical Cooperation and the Report of the US-USSR

Working Group in the Field of the Application of Computers

to Management signed in Moscow on November 28, 1973, as well

as in accordance with the Protocol of the meeting in the

U.S. of coordinators and experts in regard to Topic 4, signed

in December, 1974, a meeting of coordinators and experts on

Topic 4 was held in the USSR from June 8 to June 25, 1975.

In accordance with the program for the visit of the

American delegation to the USSR, the following institutes

and organizations were visited:

    1.   The Scientific Research Computing Center of

the Moscow State University named after M.V. Lomonosov.

    2.   The Central Research and Technological Institute

of Management Organization and Technique, Minsk.

    3.   The Institute of Cybernetics, Kiev.

    4.   The Kiev Institute of National Economy.

    5.   The Central Statistical Board of the GSSR.

    6.   The Georgian branch of the All-Union State

Technological Institute of the Central Statistical Board of

the USSR

7. The Tashkent Institute of National Economy.

8. The Academy of Sciences of the Uzbek SSR.

9. The Computing Center of the Siberian Division

of the Academy of Sciences of the USSR, Novosibirsk.

10. Institute of Mathematics.

11. Institute of Automation.

12. Institute of Economics and Organization of

Manufacturing.

13. Institute of Nuclear Physics.

14. The Computing Center of the Academy of Sciences

of the USSR, Moscow.

15. The Moscow Institute of Economics and Statistics.

16. The Statistical Methods Laboratory of the

Moscow State University.

17. The State Committee on Science and Technology.

During the visits to these institutes and organizations

American and Soviet experts exchanged opinions on the main

aspects of Topic 4 and provided detailed answers to all

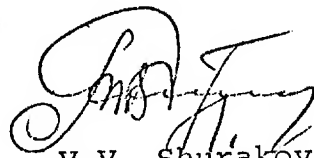questions of interest to the participants of the meetings.

The coordinators of both sides prepared plans for

American Soviet scientific and technical cooperation for

Topic 4, which are attached to this Record (see Attachments 1-5).

It is recognized by the coordinators for both sides for

Topic 4 that these proposed plans must receive the approval of the

American-Soviet co-chairmen of the US-USSR Joint Working

Group on Application of Computers to Management.

Both the American and Soviet sides have agreed that the problem of the first importance for the next phase of cooperation for Topic 4 is the elimination of the terminology barrier between the experts. This should be realized in the joint preparation of a Glossary on the Application of Computers to Economics and Management. The construction of this Glossary must be a part of the activities of each visit and workshop carried out under this agreement. Each meeting should contribute to the extension and improvement of this Glossary.

Both the American and Soviet sides have agreed that the activities in the framework of Topic 4 will be aimed at methodological and practical results.

This Record has been prepared in duplicate in the English and Russian languages, both equally authentic.

W.J. Dixon
U.S. Coordinator
Topic 4

V.V. Shurakov
USSR Coordinator
Topic 4

FORMS OF COOPERATION

Both the American and Soviet sides recognize that now it has become possible to approach the cooperation which will include:

1. The exchange of information and summaries of research in the form of preprints, abstracts, journals, working papers, reports and books. The exchange of information of interest will be performed through the heads of the projects.

2. Detailed discussions and coordination of items of each of the projects, and definition of the scale of research, the time of implementation, the forms of exchange of results between both sides.

3. The exchange of groups of experts (2-3 persons) for cooperative research on the items of the project during 1-3 months.

4. Regular symposia on different items of the projects with the goal of discussion of joint research results and the state-of-the-art in this field.

5. Brief visits of coordinators on Topic 4 and on projects for coordinating of different items of research.

6. The publication of joint research papers of the participants both in Russian and in English.

SUGGESTED TASKS FOR THE PROJECTS
LISTED IN THE PROTOCOL OF DECEMBER, 1974

1. Suggested Task Under Project 1

Mathematical Software

Basic to all computations are the subroutines for mathematical functions and operations. In particular it is important to achieve transferability from machine to machine whether in enterprises, major economic systems or different nations. Additional research is needed in the area of producing reliable software in numerical mathematics. Areas of need include numerical integration, ordinary differential equations, nonlinear optimization, nonlinear programming, and sparse matrix technology. Research in this area should produce concrete results in the form of subroutines written in mutually acceptable programming languages and documented in a standard form. Evaluation of the software should be done on comparable computing machines in the U.S. and USSR. Documentation of the software must be accompanied by the writing and testing of the program.

A workshop will be organized to explore the research areas cited above. It is proposed that the workshop be held in early December, 1975, in the U.S. and would involve about four experts from each country.

2. Suggested Tasks Under Project 2

A. Statistical Software

In both countries there is currently a need for various statistical methods in the development of the use of computers in economic planning. The problems of chief interest discussed in the visits to the U.S. and USSR have stressed.

- problems in nonlinear regression, robust estimation, and the associated optimization techniques

- problems in multivariate analysis of incomplete data.

It is proposed that:

1) Joint research be undertaken in the design and organization of generalized statistical programs for these techniques

2) Exchange of documentation of existing programs for these methods

3) Visits of about two months of one or more USSR experts to the U.S. and visit of one or more U.S. experts to the USSR for a similar period to conduct research and exchange information. The proposed dates for the visit of the USSR experts to the U.S. are in the period October, 1975 - February, 1976. The dates proposed for the visit of the U.S. experts to the USSR are in the period April - July, 1976.

B. Information Retrieval and Data Base Technology

Modern information retrieval and generalized data base management systems are having a profound impact on computer applications in industry and in research. The following cooperative program of study is proposed:

1) A study of experiences in institutes, companies and enterprises in both countries which have developed generalized data base management and information and retrieval systems.

2) A study of their application in economics and management. This will be accomplished by:

(a) An interchange of appropriate technical reports, journal articles and user manuals.

(b) A one month visit to the USSR by three U.S. specialists in October-November, 1975 followed by a similar visit to the U.S. by three USSR specialists in January-February, 1976, for a detailed review of development and applications of these systems including visits to both institutions and enterprises where generalized data base management and information systems have been developed. A joint report will be prepared in both English and Russian.

(c) A workshop of about ten specialists from each country to present current research activities and their view of needed future directions in these fields. It is proposed that this workshop be held in the U.S. in March-April, 1976.

3. <u>Suggested Task Under Project 3</u>

<u>System Development Using a Standard Library of Functions</u>

The USSR is engaged in a major effort to develop information systems for management by using standard modules or functions. This approach has also been undertaken in the U.S. in a variety of situations.

It is proposed to:

1) Compile comprehensive statements of the procedures used in each country

2) Evaluate recommendations for research to develop new methodology to utilize fully the potential of optimum levels of standardization of functions.

The specific activities proposed to carry out this project activity include:

1) Identification of relevant literature. This will be carried out on a continuing basis with reports prepared on the activities about every six months.

2) Visit in October-November, 1975 of three U.S. experts to the USSR of about one month for detailed discussions of experiences. Visits will be made to appropriate institutions and enterprises where such developments are taking place. A similar visit of three USSR experts to the U.S. will take place in January-February, 1976. A joint report will be prepared in both English and Russian.

3) A workshop will be held in the USSR in May-June, 1976 to evaluate experiences, research in progress and to propose

next steps in the research. About 10 participants from each country will be invited. Proceedings will be prepared in both English and Russian.

4. Suggested Tasks Under Project 4

Suggested tasks under Project 4 are given in Attachment 3, "Memorandum of the visit of the U.S. delegation to Novosibirsk".

5. Suggested Task Under Project 5

Training in Information Retrieval and Data Base Technology

The technology of this task requires the direct
involvement of many who are not experts in computer technology.
Therefore, there are special needs for training in this area.
It is proposed that a study be made of the educational pro-
cess in educational institutions and in enterprises for
training data processing specialists and managers in the
introduction, use and maintenance of information retrieval
and data base technology.

It is proposed that a team of two U.S. experts and
two Soviet experts conduct this study. The team will visit
the U.S. for approximately one month and the USSR for a
similar time during the period October, 1975-April, 1976 to
examine current educational practices and to make recommendations
for joint activities to improve the methodology of this
educational process. A report on the study will be prepared
in both English and Russian.

MEMORANDUM

on the Visit of the US delegation to the
Novosibirsk Scientific Center of the Siberian
Division of the USSR Academy of Sciences for
a Meeting of American and Soviet experts
of the US-USSR Working Group in the Field
of the Application of Computers to Management
in Regard to Topic 4 "Theoretical Foundation
for Software for Applications in Economics and Management

1.　The U.S. delegation visited the Novosibirsk
Scientific Center (Akademgorodok) from the 18th to the 20th
of June, 1975.　The delegation worked mainly at the Computing
Center of the Siberian Division of the USSR Academy of Sciences.
Visits to the Institutes of Mathematics, Automation, Economics
and Organization of Manufacturing, and Nuclear Physcis were
also arranged for the delegation.

2.　The names of Soviet specialists who took part in the
meetings are listed in the Appendix.

3.　In addition to the exchange of scientific opinions,
the prerequisites and perspectives for part..ipating of the
Novosibirsk scientists in the joint US-USSR effort "The
Application of the Computers to Management" were discussed.
This effort will be organized within the framework of the
Agreement between the U.S. and USSR on cooperation in the
field of science and technology signed in 1972.

It was emphasized that the Protocol of the meeting of
American and Soviet coordinators and experts of the US-USSR
Working Group in the Field of Application of Computers to
Management and regard to Topic 4 signed in the U.S., December,
1974,　 the
detailed cooperative programs on Topic 4.

4.   It is concluded, that Items 1.4 and 1.5 of Project I "Research in the Area of the Standard Mathematical Subroutines", Item 2.5 of Project II "Systems of Integrated Statistical Analysis" (data processing based on probability models) programs, statistical systems, and Items 3.1, 3.3, 3.4, 3.6, 3.7 of the Project III, as well as Project V represent the research directions which are potentially interesting for the Siberian Division of the USSR Academy of Sciences

Computing Center in the Items 1.4, 1.5, 3.4, 3.6, 3.7;

Institute of Mathematics in the item 2.5;

Institute of Economics in items 3.4 and 3.3;

Novosibirsk State University in Project V.

5.   More detailed consideration was given to cooperation within the framework of Project IV of further work in the Computer Center of the Siberian Division of the USSR Academy of Sciences.

The specialists of the Computing Center talked about many points of the important scientific program on the problems 4.2 and 4.3, described in the statement of projects and in the area of proposed research of point 4.4.

These include using the experimental realization of languages SETL and BALM (point 4.2), projecting the internal language of the programming system BETA and the research

of control structures in parallel programming languages

(point 4.3), stating the task of the universal linguistic

processors for communication with the computer, based on

natural language and its possible application in the field

of Management Information Systems.

6. It was recognized that it would be expedient to

do the following in accordance with point 4.2

- Semiannual exchange of status reports including

descriptions of current work and lists of available

documents; exchanges of reports to be made in January

and July each year

- Regular exchange of relevant publication and

reports

- Coordination of research directions of the

languages under study

- Holding workshops with 10 participants from each

side with detailed discussion of the joint research

in the second part of 1976 in the USSR and in the

second part of 1977 in the U.S.

- Preparation of publication of results of joint

scientific research

- Algorithms in 1977-1978

- Substantial joint research by U.S. and Soviet

scientists in both the U.S. and USSR for periods of

about one to three months in 1975-1976

7. It was recognized expedient in accordance with

point 4.3 to do the following in support of theoretical

research in this area.

- Semiannual exchange of status reports including a description of current work and lists available documents, exchange of reports to be made in January and July of each year

- The regular exchange of relevant publications and reports

- The preparation of reports on the joint research in 1978

- The agenda of the working conferences on point 4.2 could be coordinated with work on this point.

8. It was recognized in accordance with point 4.4 expedient to create an ad hoc group of three experts from each side for a visit of three weeks in the USSR and three weeks in the U.S. for contacts with scientific organizations and preparation of suggested joint efforts of the Soviet and American scientists for this task.

9. Mutually helpful discussions were held and questions were answered by both sides. The American visitors were satisfied with presentations of programs, of the structure and of the scientific research in the Novosibirsk Scientific Center and thankful for the hospitality.

10. This memorandum was prepared June 20, 1975 in English and Russian.

June 18
1400   Computing Center   Discussion of proposed
        Professor Ershov   agenda. Introduction to
                                 the Siberian Scientific
                                 Center

1600   Computing Center   Introduction to the Computing
        Professor Alekseyev   Center activities.

June 19
1000   Computing Center   Discussion of Research
        Professor Ershov   carried out in the Department
                                 of Information

1200   Computing Center   Discussion of Computer Center
        Dr. Moskalyev   operations.
        Professor Pogozhev   Discussion of Probability
        Dr. Nichepurenko   and Statistics Research

1500   Computing Center   Discussion of data base
        Professor Drobyshev   research and timesharing
        Mr. Vishnevskiy   systems

        Institute of   Discussion of multivariate
           Mathematics   analysis and computational
        Professor Makarov   complexity.
        Professor Trakhtenbrot
        Professor Borovkov

1700   Institute of Automation Visit of institute
        Dr. Sobolevskiy

        Institute of Nuclear   Visit of institute
           Physics
        Professor Budker

1730   Computing Center   Discussion of potential
        Professor Ershov   projects of cooperation.

Participants in Meetings of Coordinators and Experts

U.S. Delegation

D.D. Aufenkamp (Head of delegation)
Head, Computer Applications in Research
National Science Foundation

Chairman, U.S. side US-USSR Joint Working Group in the Field
   of the Application of Computers to Management

Wilfrid J. Dixon (US Coordinator, Topic 4)
Professor of Biomathematics and
   Director of Health Sciences Computing Facility
University of California

Virginia Klema
Research Associate
Computer Research Center
National Bureau of Economic Research

Benjamin Mittman
Professor of Computer Sciences
Director, Vogelback Computing Center
Northwestern University

Laszlo Rakoczi
Vice President
Technical Division
Tymshare, Inc.

Daniel Teichroew
Professor of Industrial and Operation Engineering
University of Michigan

LIST OF THE SOVIET DELEGATION.

1. Shurakov V.V.   – professor, President of the Moscow Institute of Economics and Statistics. МЭСИ.

2. Morozov V.P.   – doctor, Laboratory Chief, the Moscow Institute of Economics and Statistics. МЭСИ.

3. Hotjashov E.N.   – senior scientific worker, Depuly Director. The Central Research and Technological Institute of Managament Organisation and Technique. Minsk. ЦНИИТУ.

4. Tverdohleb N.G.   – professor, Head of the chair of the Kiev Institute of National Economy. КИНХ.

5. Ershov A.P.   – correspondent member, Head of the department of "Informatics", the Computing Center of the Siberian Division of the Academy of Sciences of the USSR. Novosibirsk. ВЦ СО АН СССР.

6. Kotov V.E.   – candidate of mathematics, Research Associate of the Computing Center of the Siberian Division of the Academy of Sciences of the USSR. Novosibirsk.

7. Rosljakov G.S.   – candidate of mathematics, Deputy Director of the Scientific Research Computing Center of the Moscow State University named after M.V.Lomonosov. НИВЦ МГУ.

8. Baraboshkin U.M. — senior scientific worker, Deputy Head of the Department of the State Committee on Science and Technology. ГКНТ.

9. Gurbenko I.T. —senior scientific worker, Deputy Chief of the Laboratory of Statistical methods, the Moscow State University named after M.V.Lomonosov.

10. Golosov O.V. — senior scientific worker, Director, All-Union State Design-Technological Institute of the Central Statistical Board of the USSR. ВГПТИ ЦСУ СССР.

Additional Task for Project 2

C. Statistical Analysis Including Interactive Graphics

The advantage of direct communication with the computational problem is important in statistical analysis whether the topic is the design of experiments, time series analysis of multivariate or analysis for complete or incomplete data or other topics. The value is great whether for the early training of statisticians and the users of statistics, for statistical consultation, or for development of new techniques. The design of graphical approaches to analysis and the languages of describing such graphics and describing their realization in pictorial form will be of value to both countries. The graphical approach will be associated with possible joint research projects in the following areas of statistical research which could be initiated separately or in combination. These areas are:

1. Screening experiments.

2. Statistical consultation in design of experiments.

3. Sampling procedures.

4. Statistical teaching techniques.

5. Numerical aspects of design.

6. Time series.

7. Nonlinear regression.

8. Robust estimation.

Forms of cooperation could include exchange of
information as well as visits of one or more U.S. specialists
to the USSR October, 1975-February, 1976 and visits of one
or more USSR specialists to the U.S. in March-June, 1976.
Cooperation could also include attendance of USSR specialists
to the Interface Symposium in Boston in the spring of 1976.